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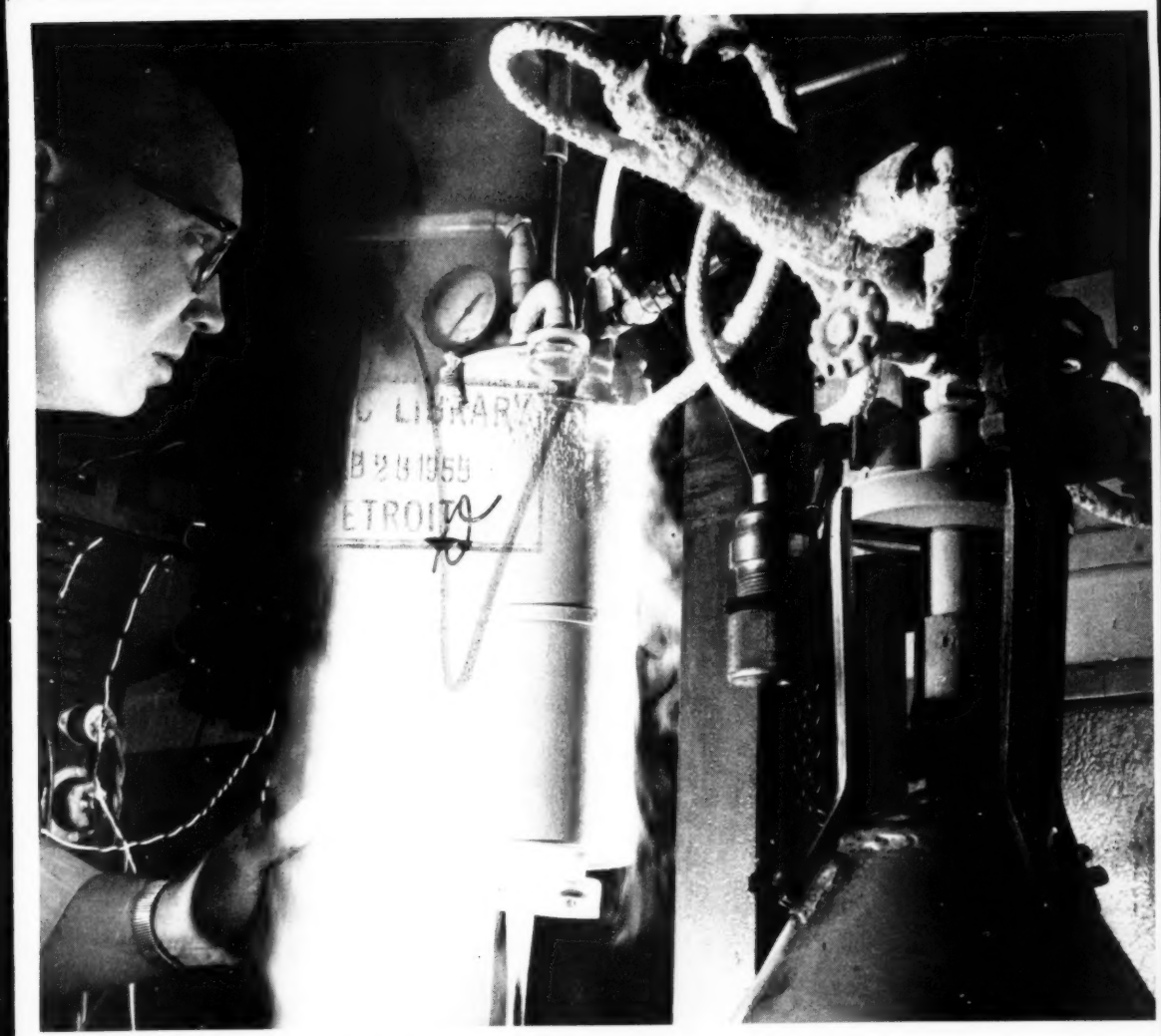

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COVER STORY

A "tug-of-war" is being waged inside the frost-covered metals testing chamber where the temperature drops to minus 452 degrees Fahrenheit. Scientists are studying the stress and strain characteristics of various types of metal that are best suited for use under extreme temperature ranges such as in guided missiles or supersonic aircraft. The testing chamber is believed to be the first of its kind to use helium to produce such extremely low temperatures.

—Westinghouse photo

February 28, WSE General Program

Speaker: Emerson A. Armstrong, consultant on public utility products and sales of Electro-Motive Division of General Motors Corp.

Subject: "A New Utility Tool Makes New Approaches Possible." The diesel engine has completely revolutionized the railroads of America. In conjunction, as a diesel-electric power plant, this engine has completely replaced steam on some railroads. During a recent year, not a single American railroad ordered a new steam locomotive. This shows the extent to which diesel has taken over.

The utility industry has discovered that this flexible and versatile power source can also be of importance to them. They are constantly finding new uses for the diesel as an electric and power source. Come to this meeting and learn more about this intriguing subject. You'll be glad you did.

March 2, Noon Luncheon Meeting

Speaker: Clifton H. Hubbell, chief engineer, Sauerman Brothers, Inc.

Subject: "Mountains out of Molehills." Material handling is a big operation and problem to many engineers and engineering firms. New ideas, or old but untried ideas, for handling material may save considerable effort and money. At this meeting you may get just the idea you are searching for. It will cover slack line cable ways, power drag scrappers, and caught line cable ways. The speaker is well equipped to discuss this phase of material handling. You are invited to hear him.

March 4, Las Vegas Party

This is another Ladies Night, and is bound to be another grand event. Don't waste any time — make arrangements to attend, today. Place, Western Society Headquarters. Social hour, 5:30 p.m. Chuck wagon dinner, 6:45 p.m., Price $5.00 each. Entertainment, by the Range Boys. Casino, open all night. We're expecting you!

March 8, Gas Fuels and Combustion Section

Speaker: M. W. Patterson, manager of industrial sales, Cities Service Oil Co., Chicago.

Subject: "Natural Gas — A Key Resource in Jeopardy." This will be a timely discussion of the Supreme Court decision of June, 1954 placing the production and sale of natural gas at the wellhead by independent producers under Federal Power Commission regulations if sold to interstate pipe lines. The speaker will outline the history of this action and its possible effect.

March 9, Noon Luncheon Meeting

Speaker: Charles L. Smith, electrical field engineer of the National Fire Protection Association, secretary-treasurer of the International Association of Electrical Inspectors, and a noted national electrical code authority.

Subject: "What Causes Electrical Fires." This highly competent speaker will review causes of reported electrical fires in the United States, and will discuss trends.

March 14, WSE General Program

Speaker: S. D. Forsythe, general superintendent of engineering, Chicago Transit Authority.

Subject: "Tomorrow's Rapid Transit." The speaker has been intimately involved with the development of lightweight Rapid-Transit cars, and the plans for Rapid Transit in the Congress street superhighway. His talk will include a discussion of modern Rapid Transit equipment, and the thinking behind modernization and extension of Rapid Transit facilities.

March 16, Noon Luncheon Meeting

Speaker: Colonel Thomas M. Larner, 22 AAA Group, Fifth Army.

Subject: "Military Defense of Chicago." Col. Larner will explain the necessity for, and the details of, the military defense of Chicago; what is "Nike"; and whether an air attack can be stopped. He will also answer other questions. Don't miss this.

Progress Report & Outlook

Saint Lawrence Seaway Project

By Raymond F. Stellar

Engineers both here and in Canada have moved into the St. Lawrence Seaway job with sleeves rolled up. Their entry into the scene is taking place without fanfare and without wide publicity. That's traditional with the engineering profession generally.

A job has to be done. In this case a major marine job on one of the world's greatest rivers. It is challenging. The best that modern engineering design can bring forth is going to be incorporated into the plans and specifications.

Construction of navigation locks and related marine work is a specialty even within the engineering fraternity. Essentially all of this type of public works both in the United States and Canada has been engineered by the Government, primarily the Federal Government. Construction generally has been by private contractors with their operations supervised by the Government.

For that reason the present design effort now picking up momentum weekly is being accomplished by Federal engineers schooled in this particular specialty; structural design engineers; hydraulic engineers; electricals; mechanicals; soils and foundations specialists; hydraulic model-testing specialists; and a number of others.

Similarly, certain contractors specialize in this field of construction. A blown out cofferdam and other vagaries on this type of work are not for inexperienced hands.

Division of Work and Cost

The two agencies charged by law with the joint accomplishment of the Lake Erie to Montreal Seaway are the St. Lawrence Seaway Development Corporation in the United States and the St. Lawrence Seaway Authority in Canada. They are bending every effort to discharge their responsibilities with competence and integrity.

Under this joint construction, pursuant to the Wiley-Dondero Bill, the United States will build in our territory the Long Sault Canal with two locks near Massena, N. Y., to by-pass the powerhouse and spillway dam being built near the foot of the International Rapids section; the Point Rockway Canal with one lock below Ogdensburg, N. Y., to by-pass the power project's control dam; and lower rock shoals to provide a more commodious channel in the Thousand Islands section, chiefly in the Alexandria Bay area.

Canada will construct new deep-water facilities including four locks between Montreal and Cornwall, Ont., together with deepening the channel between the locks in the Welland Canal. Costs are estimated to aggregate about 300 million dollars, 100 million to the United States and 200 million to Canada.

With these modernization improvements completed, a controlling channel depth of 27 feet will prevail, as compared to 14 feet now between Montreal and Ogdensburg. And the 22 locks in that reach, 50 to 75 years old, each 252 feet long, 44 feet wide, and 14 feet deep, will give way to seven new locks 800 feet long, 80 feet wide and 30 feet deep over the sills.

When the United States Government in 1952 agreed to permit the power development in the International Rapids Section to go forward as a separate undertaking, it did so with two conditions. First, commitment was received from Canada that it would provide the Lake Erie to Montreal Seaway project concurrently at its expense. Second, action by Congress to enact legislation for construction of navigational facilities on our side of the river in the International Section was not precluded. Congress exercised that option in the Wiley-Dondero Bill. The President strongly supported the legislation which became law last May 13. The key consideration there, in my opinion, was the desire of the United States to become a co-partner in this great development in order that we could have a voice in the construction, management, and operation of this waterway, both with respect to our national security and peacetime economy. The latter includes voice in the shipping tolls to be established.

In the exchange of notes of last August 17 Canada among other things indicated its intention of proceeding with the building of a canal and lock at Iroquois, opposite our authorized facility at Point Rockway. Construction of paralleling and duplicating facilities is unnecessary immediately for accommodation of shipping. Further study is now being given the afore-mentioned notes with a view to their appropriate clarification.

Progress Report

Organizationally, the Seaway Corporation has its headquarters office in Washington with Mr. Lewis G. Castle, Administrator, in charge; a Buffalo office with Mr. M. W. Oettershagen, Deputy Administrator, in charge; and a field engineer at Massena, N. Y. We are a small organization along executive-management lines. We are functioning in a manner similar to that of the New York State Power Authority. Our Advisory Board parallels the Power Authority's Board of Trustees.

As announced last September, the Corps of Engineers, U. S. Army, is serving as our designing and contracting agent. A few words on the reason for the selection and our operating procedures may be of interest.

The Corps of Engineers was selected because of its familiarity with the back-

Mr. Stellar, engineer, Saint Lawrence Seaway Development Corp. presented this address before the Syracuse Society of Architects, in the Fine Arts Museum Auditorium, Syracuse, N.Y., on Jan. 17, 1955.

ground of this river development, its long experience in the specialized field of design and construction of lock and canal work, and its having a going organization prepared to take on the job without loss of time for personnel build-up.

All of the step-by-step planning operations by the Corps of Engineers are subject to the review, modification and approval by the corporation, including design criteria, general layout plans, and contract plans and specifications. Advance notices to bidders, advertisements for bids, and awards of contracts are not made without prior clearance by the corporation. Similarly, negotiations for acquisition of necessary lands are not initiated without prior screening and concurrence by the corporation.

Costs of all seaway activities by the corps are reimbursed from proceeds of revenue bonds issued by the corporation which has established desired accounting procedures and audits all expenditures. The corporation examines all financial transactions and performs all other managerial duties including reporting to Congress through the President and will be the chief source of information for the public concerning the seaway.

Design work is being accomplished basically by the corps at its Buffalo office, with some support particularly on lock gate design by Nashville. This planning is screened at the Chicago and Washington offices of the corps, as necessary, depending upon the complexity of the situation at hand. The corporation receives copies of all design reports and proposed plans and specifications as developed at Buffalo and is thus able to act with maximum dispatch when the full chain-of-command planning process by the Corps of Engineers is accomplished.

Actually, a high degree of coordination and consultation takes place continually. Policy and knotty technical problems are recognized early and dealt with as quickly as practicable.

A board of four engineering consultants has been selected to advise the corporation on important and unusual matters. For example, in December the board was asked to examine the basic plans which go back to 1941 and 1942 for the chief segment of the United States seaway program—namely the 10-mile Long Sault Canal including the two locks near Massena. The board confirmed the soundness of the location and general design. Recommendations of the board on points meriting further study are now being carefully examined. Advisory service by this board is also available to the Corps of Engineers.

Our first major contract, covering excavation of some 4,000,000 cubic yards of material for the upper 3-mile section of the Long Sault Canal, will soon be awarded. Colonel L. W. Olmstead, the corps' district engineer, at Buffalo, is the contracting officer. There was lively bidding on that job; 27 bids were received. The lowest bid and several others were in a very favorable price range from the government's standpoint.

Bids for excavation of about 2,000,000 yards of excavation at the Robinson Bay lock site, Long Sault Canal, were opened February 2. Bids are scheduled to be advertised for excavation of 2,500,000 yards of material at the Grass River lock site February 15 and for the Long Sault Canal proper, involving 12,000,000 yards, March 15.

Meanwhile design is being pushed on the various locks in the United States Seaway program, which are the most important individual elements. The same may be said on other items such as highway and railroad relocation including the highway tunnel under the Robinson Bay lock northeast of Massena. All of this design is, of course, based on the detailed borings and other field surveys recently developed. Bids for the general construction contract for Robinson Bay lock will probably be advertised about September 15 and for Grass River lock about October 15.

All seaway construction by the United States will be by contract, after competitive bidding. Contracts will be awarded to the lowest responsible bidder.

A high degree of mechanization on this canal and lock construction may well result. Generally this permits the contractor to hold his costs down. Naturally we in the corporation are anxious to see spirited bidding on the various elements of our project. We are anxious to accomplish our project within the 105 million dollar money limitation contained in the Seaway Act, and preferably well below it. Lower costs mean more rapid self-liquidation or lower tolls for the same pay out period.

These U. S. Seaway facilities are scheduled to be ready for operation on a 27-foot channel depth basis, with the opening of navigation at the beginning of the 1959 shipping season. They are also scheduled to be ready for operation

(Continued on Page 10)

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For Fundamental and Applied Research

Grants in Aid

By John T. Rettaliata, MWSE

Traditionally a major source of support for both private and public higher education has been associated with an industrial background. The wealthy individuals of the last century who founded great private universities in numerous cases obtained their means through industrial enterprises. Similarly, expanding industry, through taxation, played a predominant role in the establishment of many state institutions.

Today, private higher education continues to look to industry for assistance. However, while the origin of the desired support has remained the same, the medium through which it has been formerly realized has undergone drastic change. The wealthy individual, because of prevalent tax policies, is rapidly becoming extinct. Thus education now finds it necessary to adopt a more immediate approach, and appeal directly to corporate management for aid.

Corporate support of higher education can be accomplished in various ways but the research grant, the subject of my assignment today, has been one of the most frequently used methods. There are probably obvious reasons for this. One of the principal concerns of corporate directors is to justify to stockholders any financial aid to education. Certainly research can be demonstrated to have a direct benefit to the welfare of industry and, consequently, would be less subject to attack on this score. Fortunately, the presumed legal barriers to corporate aid to education are gradually disappearing so more philanthropic freedom can be anticipated.

Research is a necessary and proper part of higher education and thus should be encouraged. It is the function of a university to create new knowledge, through basic research, as well as to disseminate it, through teaching. The research activities of universities have been increasing at a rapid rate. Unfortunately, however, the emphasis has not been on basic research but rather on the applied, or hardware, type of project. This is understandable in a period of war where national security is involved and weapons research is vital. But the inventory of basic scientific discovery is rapidly being depleted by the drain of technological progress. It is important that the stockpile be replenished lest we become a nation devoid of the means for further achievement. The research grant is a means of accomplishing this replenishment.

While the desirability of fundamental research should be recognized, it should not be concluded that applied research is out of place in an academic institution. The university should also be concerned with the practical application of the new knowledge which it creates. By so doing its tremendous intellectual capacity can participate in the solution of society's problems. The important thing is to maintain a reasonable relationship between the two types of research. It has been estimated that in the intensified war-time research programs there was conducted approximately twice as much applied research as there was basic. A reversal of this ratio would seem more desirable.

Since the subject under discussion concerns the matter of research grants it may be well to define some of the ways these can be effected. Part of the function of a university is to perform individual scholarly research of a fundamental nature. The professors engaged in this kind of activity have a reduced teaching load so as to give them the necessary time for research. The university accepts the costs of this kind of research as a normal budget item. It's the type of work a university should be doing.

If, however, some industrial firm is interested in a particular research program of this nature, where the boundaries of knowledge are extended, it may wish to share some of the costs, such as the direct salaries associated with the program. Because of the mutuality of interest between the company and the university, a sharing of the costs is an equitable arrangement as each is a potental beneficiary. The company and the public stand to profit from the published results; and the university from the concomitant recognition, and the assistance toward balancing its budget.

Another type of research endeavor is in the sponsored project category. A company may have a particular field of interest which it requests the university to explore. The university may decide that, although of the applied type, it is a worthy project which it is qualified to undertake. It is not a project, however, which the university would ordinarily include in its own research program. In such cases the company should bear the full costs of the project, both direct and indirect. There should be no subsidy from university funds.

It will be noted that a project of this type does not assist in budget balancing when a university's staff is otherwise fully occupied. It is of direct benefit in this regard, however, when an institution has more staff than it requires, such as in a period of declining enrollments, but which it must retain because of tenure regulations. Of course, there can also be other types of research grant arrangements but it would appear that they would lie somewhere in between the two just described.

Over the last decade or so sponsored

(Continued on Page 14)

Dr. Rettaliata, president of the Illinois Institute of Technology, Chicago, presented this address before the Midwest Conference on Industry and Higher Education, held in Chicago on Dec. 16, 1954, under the auspices of the Council for Federal Aid to Education.

New Gauge May Help Airmen

High-altitude airmen will be able to operate their breathing apparatus more efficiently with a new, liquid oxygen-measuring gauge developed at Armour Research Foundation of Illinois Institute of Technology, Chicago.

The electrical gauge is in production at the Aro Equipment Corp., Bryan, O., which sponsored the Foundation project.

The gauge is the first device of its kind capable of withstanding high pressures encountered in liquid oxygen converters, while at the same time detecting very slight changes in the pressure.

Expected to replace the more bulky mechanical gauges presently used in aircraft, the gauge can permit pilots to read only one indicator dial for determining the level of oxygen in one or more converters, according to its designers, George Forster and John Granath, Foundation research electrical engineers.

The converter consists of an oxygen tank and other equipment used to convert liquid to gaseous oxygen.

Mechanical gauges require long tubing and separate indicators for each oxygen converter—wasting vital space on equipment-crowded aircraft, the engineers explained.

With the electrical gauge, however, the tubes are replaced by wires, and a selector switch enables one dial to do the work of several. Depending on the size of its crew, as many as four oxygen converters often are used in an airplane, they said.

Working models have been submitted for evaluation to a number of airframe builders as well as to the Aero-Medical laboratory, Wright-Patterson Air Force Base, Dayton.

The new gauge is lightweight, Forster and Granath said. Experimental models of the complete oxygen-measuring devices weigh less than two pounds, and present development work indicates that even this weight will be decreased.

This economy in weight is effected, according to the designers, by eliminating the need for an amplifying system ordinarily used to boost voltage for operation of the indicator with conventional sensitive gauges.

The gauge is strong enough to withstand a differential pressure of 20 pounds per square inch in spite of a full scale range as low as 0.15 pounds per square inch in a 5-liter converter tank.

Armour Research Foundation has developed the experimental gauges for several sized tanks from 5 to 20 liters.

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Nominating Committee Is Appointed

To the Corporate Members:

I am pleased to announce that in accordance with Article X, Section 3, of the Constitution, the Board of Direction has appointed a Nominating Committee as follows:

C. E. DeLeuw (Board Member)
H. P. Sedwick
E. G. Fox
V. O. McClurg
C. B. Cox
M. V. Maxwell
E. A. Schmidt

The Constitution also provides that suggestions for nominees shall be solicited in the publications of the Society.

J. EARL HARRINGTON
Executive Secretary

Tear off and Return

To the Nominating Committee, WSE:

I suggest the following names for consideration by your committee for offices indicated.

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Remarks on Atomic Energy

By Lewis L. Strauss, Chairman, A.E.C.

On an occasion such as this, it would be appropriate under ordinary circumstances to begin with a quip or anecdote, but I am ill suited for it today. It is a sad week for me—for all of us in the Atomic Energy Commission. At this very hour in the Rockefeller Chapel of the University of Chicago, I understand that memorial services for one of the great men of our age are being solemnized. In the early hours of Sunday morning the telephone beside my bed in Virginia rang to bring me the tragic news of the death of Enrico Fermi.

This great man, who had lived in your midst with the utmost modesty for the past 15 years, was the true architect of the Atomic Age. We shall no longer be able to show him any recognition for the fact that he had been in the forefront of the march of human knowledge for more than 30 years, or for the fact that his contributions to theoretical and experimental physics enabled free men to hold Communist tyranny at bay for the last nine of those years.

Just a dozen years ago yesterday a pile of graphite blocks and uranium billets which he had put together under the stands at Stagg Field became the first atomic reactor. Today there are more than two score of them, of one design or another, in our country. One, installed in the submarine Nautilus, will soon be driving her through the deep at hitherto undreamed of standards of performance. Another, now building at Shippingport, Pennsylvania, will be delivering at least 60,000 kilowatts of electrical energy to light the homes and turn the wheels in that industrial area. These are only prototypes of many, many more to come.

I had the great good fortune to know Fermi for 16 years. In the late 30's he helped me in an attempt to make radio isotopes cheaply so that they would be available for cancer therapy to replace scarce, expensive radium. Thanks to the discoveries which he made, such isotopes are now not only very cheap but plentiful, and medical researchers have them in abundance and great variety to aid their attack on cancer and other dread diseases. It is tragic to think that had Enrico Fermi been spared but a few more years, his life might have been saved by medical advances stemming directly from his own great achievements.

I had the sad privilege of delivering to his widow the award voted to him some days ago as a tribute from his grateful fellow citizens represented by the Atomic Energy Commission with the approval of President Eisenhower. In future years these awards will be known as the "Fermi Prize." Besides perpetuating his name, which of course needs no action of government as a memorial, it is our hope that they may stimulate and encourage others to go forward into the unknown reaches of knowledge, to explore, to chart, to call up their followers, to instruct them, and then to press ahead again. Like the Italian navigator, to whom he was compared 12 years ago, Fermi, as did Columbus, found a new continent—more than continent, a new world. Those of us he leaves upon its beach-heads cannot do otherwise in the presence of his example but penetrate the interior and develop the riches he opened up for the good of all men everywhere.

This being the last month of the year, it is an appropriate time for stocktaking and inventory. We might profitably pause long enough for a trial balance of the ledger on the 12 years of experience since Fermi's first atomic pile made the instruments chatter as they recorded the generations of neutrons born of the first chain reaction.

In the 12 years, we have on one side of the ledger appropriations of public funds in the neighborhood of 14 billion dollars for the whole atomic energy project in war and peace. To balance this we have vast plants, great discoveries, and vital stockpiles of weapons and fissionable material. These weapons have indeed been the first and paramount concern of the Atomic Energy Commission, and many people think that the production of bombs is all that there is to show for the gigantic expenditure of treasure and effort. A good case could be made for the fact that this would be well enough were it indeed the whole story, but it is not. I would like to give you a quick preview of some of the other items on the credit side of the ledger. They are growing so rapidly in number that the ink is scarcely dry in recording one before another is ready for entry. From among those I shall list, we will arbitrarily omit specific reference to medical progress—itself worth perhaps all that has been spent—in order to concentrate on fields that might conceivably be of specific interest in this great capital of agriculture and industry.

Much has been said and written about electrical energy from the atom, but a strong economy depends on many factors other than plentiful power. For example, a recent publication of the Department of Agriculture states that crop production losses, due to all causes, average "about 13 billion dollars' worth of goods per year, nearly one-third of the potential production. Some 120 million fewer acres of cropland . . . would have produced the 1942 to 1951 volume of food, feed and fiber production if all these causes of loss had been eliminated."

We all know of the splendid job that the Department of Agriculture has done and is doing through education and research to reduce these losses. One of the causes of agricultural loss, most difficult to combat, is disease—plant disease. One of the methods which shows great possibilities in this line is the production of mutants of crops which are resistant to

Mr. Strauss, chairman, United States Atomic Energy Commission, prepared these notes for delivery at a luncheon meeting of the Executives' Club of Chicago on Dec. 3, 1954.

disease. These mutants can be produced by radiation.

Experiments with radiation, designed to produce such beneficial mutations in plants, have been carried on successfully in the laboratories of the Commission at Brookhaven, Long Island, and elsewhere. There has been notable success in the development of a strain of oats which is resistant to the disease known as rust. Rust-resistant oats, if they can be perfected for more species, will be a potential saving for the American economy in excess of 50 million dollars per annum. For the purposes of our imaginary balance sheet, we might capitalize this at 3 per cent and set up a sound asset of 1½ billion dollars.

Other researchers are working on other cereal and leguminous crops. Some who are familiar with what is going on foresee our entire investment in atomic energy returned many times over in the effect on agriculture alone. As instances, we might note two of many—I am told that our tomato crops suffer a great annual loss in yield due to the disease known as wilt. It has been found that by using a proper localized dosage of irradiation, at least one generation of wilt-resistant tomato seedlings can be produced. And here in Chicago, the meat-packing center of the world, some of you I am sure already know that prepackaged meat products, if exposed to mild gamma-ray pasteurization, can remain in the grocer's stock for nearly 21 days instead of 3. Studies show that a complete facility for this purpose could be built for considerably less than three-quarters of a million dollars. If financed with 6%, a charge of a small fraction of a cent per pound of the irradiated profit would suffice to amortize it in 5 years.

The item next on the credit side is a very large one. This is the "Atoms for Peace" plan of President Eisenhower—the proposal which he made to the General Assembly of the United Nations just a year ago next week. Ever since we first suggested atomic energy cooperation for the mutual benefit of nations, as an alternative to war, and ever since we offered to give some of our technical know-how and to make available some of our material atomic wealth to other countries, the Communist world has belittled and distorted our suggestions and our proposals. The Soviets charged that our proposition was not and would never be specific; and, while they filibustered the discussions concerning atomic cooperation, they denounced us by saying that we were trying to narrow the scope of our offer and that it had been insincere in the first place.

Then, about two weeks ago we offered to earmark 100 kilograms of fissionable material for use by other countries. You may perhaps be interested to know what can be done with 100 kilograms of such material. There has been considerable speculation as to what it could do for the countries that may eventually receive it. Having heard some mistaken statements, this may be a good place to put the figures into proper perspective. In the first place, the fissionable material which we will provide, will *not* be of weapons-grade. It *will* be in a form particularly suitable for peaceful application.

One of the best examples of peaceful use of this 100 kilograms of fissionable terial would be as fuel for *research reactors.* There is a particular research reactor, which might be of special interest to you because it is located not very far from here and it is in the public eye today.

I speak of the research reactor known as CP-5. We perhaps overindulge in code names—CP-5 means Chicago Pile No. 5 at the Argonne Laboratory. The distinguished director of the Laboratory, Dr. Walter H. Zinn, under whose wise and devoted supervision this reactor has been designed, constructed, and operated, is here with us today. This is a significant occasion for the CP-5 because the Commission is making the first announcement that we have removed the security restrictions as to access which have surrounded it. The CP-5 reactor has been in the main declassified and pertinent information concerning its construction and operation will be available. This is another example of the efforts of the Atomic Energy Commission to make atomic energy facilities more accessible to American industry. During the past six months, while still under security requirements, many irradiation services have been carried on in the CP-5 for both universities and industry, but now we expect that much more use can be made of this modern research instrument.

Other countries could use allocations from the 100 kilograms of fissionable material in research reactors like the CP-5, which is fueled with aluminum clad uranium, enriched in the isotope 235, and cooled and moderated with heavy water. This combination of materials permits the realization of a high neutron flux, which is an important fea-

(Continued on Page 18)

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Sound Waves To Be Used in Tests

Sound waves soon will be used to give scientists and engineers a better insight into the composition of a broad range of materials.

Two "sound" experts at Armour Research Foundation of Illinois Institute of Technology, Chicago, have predicted that non-destructive acoustical tests will help determine other than acoustical properties of the materials.

The scientists—Dr. Howard C. Hardy, assistant manager of the physics research department, and Robert W. Benson, supervisor of the acoustics design section in the same department—explained that the acoustical tests in the past have been used primarily in determining such properties as the sound absorption of materials.

The new tests, to be performed by sending sound waves through materials, will detect flaws so that defections may be anticipated before they occur, said Hardy and Benson.

Application of the tests is very broad, they reported, because sound waves propagate easily through most materials —in fact, they constitute one of the few kinds of energy it is possible to get inside metallic materials.

They forecast the following developments in acoustics will bear watching during the coming year:

—"Built-in" sound systems in homes, offices and auditoriums.

—More widespread quieting of offices and plants to improve working conditions.

—Community efforts to reduce noise from airplanes, trucks and diesel electric locomotives.

Hardy forecast that architects will give increased attention to acoustical design in homes and other structures. Since audio systems are an essential part of television and radio sets, both fixtures in the modern home, he advocated giving as much consideration to their performance in the completed building as that presently given heating units and lighting.

Hardy said he expects a trend toward "built-in" television and hi-fi sets aimed at taking full advantage of improvements being made in this apparatus. Portable equipment such as radios still will be used, he stated.

Everything in plant and office equipment, Benson predicted, will get quieter within the next few years. He said employers now agree generally that quiet surroundings are essential to making a good product.

The first move toward quieting offices came several years ago with efforts to silence typewriters, he noted, and this trend has spread to desk calculators and similar equipment. Hardy pointed out that most offices now are "acoustically-treated" and predicted plants soon will get the same treatment.

"Something," Benson warned, "must be done to reduce the airplane, truck and locomotive noise nuisances." Commenting that the problem is being studied by almost everybody in the field of noise, he explained, "Too many people are complaining."

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St. Lawrence Seaway

(Continued from Page 4)

for 14-foot traffic in September, 1958. Even that date may be advanced.

Accordingly, this job is on a tight schedule and time will be of the essence from here on out. Construction will commence this year and will be intense in 1956, 1957 and early 1958.

Nevertheless, no rash decisions will be made. To overcome the present bind of time on design, top specialists in the various fields are being pulled in to advise and assist, and to speed up the design process. But this is no push-button affair. While many locks have been built by the Federal Government heretofore each new one is tailor-made to fit the peculiar local conditions and these new locks and their attendant work are no exceptions.

Canadian Counterpart

Our counterpart across the border, the Canadian Seaway Authority, is likewise gearing itself to meet this corresponding schedule.

We are in frequent consultation with the Canadian Seaway officials on design matters and work scheduling generally. Obviously the accommodations to be afforded the ship operators at the various locks and approaches thereto should be as uniform as practicable throughout the new facilities now to be built. Our association with the Canadians is on the friendliest terms.

Presently the Seaway Authority is headquartered in Ottawa. Design work is being accomplished by the government's forces at Montreal.

Coordination with Power Building Agencies

Similarly we are working closely and cordially with the Power Authority of the State of New York and the Hydro-electric Power Commission of Ontario. Naturally we have more dealings with the Power Authority since our facilities and theirs are on the same side of the river.

Concurrent construction of the 600 million dollar power development in the International Rapids section is essential to the most economic development of the 27-foot seaway in that reach. The seaway there will be geared into the new pool level created by the power project. A number of power project features directly assist the seaway, such as extensive dredging and excavation in the Galop Rapids section below Ogdensburg to constitute a combined seaway-power channel in that 8-mile area.

A few examples will illustrate the coordination between ourselves and the Power Authority:

(1) The power agencies plan to begin raising the pool level in September, 1958, or before and are are gearing our operations to have the Long Sault Canal ready for 14-foot traffic then. This reduces cost otherwise necessary on the part of the Power Authority and Ontario Hydro to accommodate navigation on an interim basis during the pool raising period.

(2) To avoid the contemporaneous acquisition of land by a state agency and a Federal agency and the confusion resulting therefrom in the minds of the landowners, an arrangement has been developed whereby the Power Authority acquires all of the lands needed for the two projects. Our requirements are presented to the Power Authority in appropriate form in cooperation with the Corps of Engineers. The Power Authority in turn operates through the Bureau of Rights of Way and Claims of the New York State Department of Public Works. We reimburse the Power Authority for seaway lands and the acquisition cost.

(3) Our first excavation contract includes provision for construction of a section earth dike, a part of the power project to assist in retaining the new pool level. By combining the two into one, savings accrue to both agencies.

(4) Highway access to Barnhart Island. The Power Authority was very anxious that we provide a high fixed bridge above or a tunnel under the Long Sault Canal on a new highway from Route 37 east of Massena to extend northward to the river. After study of the entire highway relocation problem facing the corporation an understanding has been arrived at whereby we will build the highway tunnel under the Robinson Bay lock on an alignment that will suit the Power Authority and it will as-

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sume the responsibility for the construction of the remainder of this 2½-mile road, including the cost of a new bridge across the Grass River at the southerly end which otherwise would have been a cost in whole or in part to seaway funds. This road will be on the future main highway artery on our side of the river to Cornwall. Additionally it will undoubtedly also carry much tourist traffic to the State Park on Barnhart Island. To tie in with this highway net, the Seaway Corporation will assume the responsibility of reconstructing the east-west section of this road leading to Cornwall Island and Cornwall.

Economic Outlook

The seaway project has captured the imagination of the American people, as evidenced by widespread press coverage.

Various Great Lakes ports are studying ways and means of obtaining their respective shares of increased business. Industrial, commercial and agricultural interests in the Midwest area and along the St. Lawrence frontier are sharpening their pencils to determine the best methods for using the seaway profitably.

The railroads, too, are not sitting idly by. They have long been owners of large blocks of harbor frontage and they will make the most of new traffic patterns.

Also our own salt-water shipping companies are taking a good square look at the situation. Specific inquiries have been made by them of the actual navigation conditions to be made available. One such salt water official was recently quoted as saying "Operators must decide soon whether they will shape their policies to provide for special services to call directly into the Great Lakes."

Transportation at low cost remains an essential ingredient in our economy. The seaway will provide such transit for many commodities. In the forefront will be bulk items such as grain, iron ore, coal and petroleum. Also favorably affected, however, will be a considerable block of general cargo ranging from dairy products to automobiles and agricultural machinery.

We have eight states fronting on the Great Lakes with a population of 58,000,000 which have immediate access to this new shipping potential. In addition there are nine states—Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas, Montana, Wyoming and Colorado—with a combined population exceeding 13,000,000 that are tributary in an economic sense. This is the immediate and adjacent hinterland which has so long sought an improved direct outlet to the ocean. Shippers in this area have contended that construction of the Panama Canal with other factors placed this mid-continent region at a competitive disadvantage with our Atlanta, Gulf and Pacific seaboards. Now that disadvantage is about to be partially corrected.

In Canada too the project is being hailed with enthusiasm. Government officials have termed it the greatest water resource development in the country's history.

Since my paper deals with the seaway only, I shall not allude to the power development except to say this in passing. New York state, and especially the "north country" and central New York point to being the chief power project beneficiaries including (1) increased business during construction, (2) luring of industries requiring ample water supply and large blocks of low cost power, including electro-metallurgical industries, (3) increased tourist trade because of the "second Niagara," and (4) a better balanced economy between agriculture and industry.

Replacement of the 14-foot system by a 27-foot channel system above Montreal will mean that larger ships carrying heavier loads will be able to navigate with decreased shipping cost—decreased unit cost. This is the simple and cardinal point.

An example or two will illustrate the difference in cargo tonnage.

Just a month ago I rode through the Welland Canal on a "laker" to observe the facility or difficulty of the captain in his navigation. That ship was the *John E. F. Misener*, 654 feet long and 68-foot beam. She was loaded down to 23½ feet with grain, 644,000 bushels, equivalent to about 19,000 short tons. She was headed for Prescott, Ont. Now, in comparison, the "canalers" plying the present 14-foot system are about 250 feet long and 40-foot beam and then can handle only about one-seventh as much.

Again, consider iron ore. Last year a number of transits were made by "canal-

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ers" carrying iron ore. However, their loads averaged about 2,600 short tons or about one-eighth the loading in the modern lakers, which can accommodate about 22,000 tons or more of ore. Because of the difference in economy of operation, shipment of ore after the seaway is opened will be almost exclusively by lake ships and essentially by the largest and most modern type. The old canalers appear to be seeing their last days.

The old adage of "Go west, young man, go west" might now for the lake skippers at least be changed to "Go east, skipper, go east." Because the range for lake shipping, presently of the order of 25 feet controlling depth over the 1,200-mile sweep from Duluth to Ogdensburg, is now being extended eastward to Seven Islands, another 600 miles. Our lake shippers and their crews might do well during the winter off-season to study a little French which could prove helpful in going ashore at Seven Islands or at other points in Quebec.

Indeed about three-fourths of the seaway traffic is now expected to be moved by lake-type ships, as distinguished from ocean-going carriers. This is due chiefly to the Labrador ore discovery and the demand for such additional supply of high grade open pit ore for the furnaces in our midwest arsenal. This shift of traffic composition to a heavy accent on what may be termed "interlake" or "inter-system" carriage is a significant departure from the climate of the 1920's and the 1930's when the dominant portion of the prospective tonnage was general cargo in the overseas trade.

This is not to say that the general cargo tonnage now anticipated is unimportant. It remains vitally important to the particular businesses concerned and high transport charges generally apply to it. Such goods will be moved in ocean-going freighters. The 27-foot channel will accommodate the vast majority of the world's ocean-going dry cargo ships with profitable pay loads. This was demonstrated by a check study of foreign traffic at New York harbor for 1952. Recently a group of our Mariner ships, our largest and fastest dry cargo freighters have been leaving our shores with full cargo loads producing average drafts of only 22½ feet. These ships have crossed the Atlantic at average speeds of 20 to 21 knots, which is fast travel.

As to actual traffic statistics, the 14-foot canal system now handles about 10 million tons a year and the Welland 18 million. In comparison, Buffalo 23 million, New York 152 million, Duluth-Superior 73 million, Toledo 31 million, and Baltimore 43 million.

A 1951 report of the Canadian Trade and Commerce Department indicated a prospective upbound iron ore movement of 20,000,000, which is entirely new traffic. That increases the prospective St. Lawrence traffic immediately to 30,000,000. With certain other increases a total of 44½ million tons was reached as the seaway's traffic prospect for the near future.

Last summer an independent study was made by the Seaway Corporation, which came up with an estimated St. Lawrence River traffic total of 36½ million tons for 1959 and 52 million tons for 1965.

From the foregoing I am led to the following observations concerning the economic impact of the seaway:

(1) It will stabilize the great steel industry and allied businesses in the midwest area and permit future growth, as contrasted with a shift to seaboard areas.

(2) It will spur further industrialization in the lakes area, which has the basic advantages of ample water supply, low cost transportation for basic raw materials, and other inviting essentials.

(3) It will improve the general economy of that wide area, including shipping advantages to the huge grain belt.

(4) It will augment integration of our economy with that of Canada. Our population and Canada's are continuing to grow. Now we exceed Canada's population 10 times. Correspondingly our production capacity is greater but our consumptive requirements as well. Canada's huge mineral resources in the vast St. Lawrence Gulf region will find increasing market in our country. Both countries will be mutually benefited.

(5) It will produce some unavoidable impacts, mostly of short-term effect. The same may be said of the progression of events here in New York, when a railroad was built paralleling the Barge Canal System, and now the thruway parallels both.

(6) Generally, widespread opportu-

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nity will be created by the coming transformation of the Great Lakes into a virtual second Mediterranean. However, every port on the Great Lakes will not face the need for transformation. The lakes' harbors now range from 25 feet depth downward to 10 feet and less. Each local situation should be analyzed realistically. Generally some substantial hinterland support is essential for new major harbor developments. Local interests should avoid the extremes of wild enthusiasm on the one hand and pessimistic, overly conservative or unimaginative outlook on the other.

(7) The connecting channels on the Lakes at and above Detroit are now of 25-foot controlling depth downbound and 21-foot upbound. A survey is under way by the Army Engineers to determine the advisability of deepening to 27 feet, presently indicated to cost $109,000,000. If the current favorable finding by the Corps' field officers is concurred in by reviewing authorities in Washington, and if in due course the Congress should see fit to authorize such further improvement and appropriate funds for its prosecution, the original concept for the overall seaway will be restored. Wide areas in the United States and Canada west of Lake Erie will receive a further lift to their economic opportunities.

In conclusion, the Lake Erie to Montreal Seaway project in my opinion is a wise and economically sound public development. Our Seaway Act is unique in that it requires imposition of tolls to make the project self-liquidating in 50 years or less. Canada's Seaway Act is permissive with regard to charging tolls. Administratively, however, that government has determined that it also will charge tolls. Thus this project, like many recent turnpikes, will be paid off by the users of the facility. The Panama Canal, another international waterway, is in the same category.

In fact, we may have to consider installing twin locks within 10 to 15 years to handle traffic growth. Be assured that the engineers and officials concerned with this construction effort are taking cognizance of that possibility as far as practicable in present designing.

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Illinois Tech. Gets $10,000 Grant

A $10,000 fellowship grant has been made to Illinois Institute of Technology, Chicago, by the Electro-Motive Division of General Motors in honor of the man who harnessed the Diesel engine to the railroad locomotive.

He is R. M. Dilworth, developer of the Diesel locomotive and retired Electro-Motive chief engineer, a position he had held for 25 years.

Providing $2,500 annually for four years beginning next September, the fellowship will be used by graduate students at IIT for research on the control of sound in Diesel engines.

The fellowship was announced at a recent dinner during which leaders in transportation, industry and education paid tribute to Dilworth's achievements.

Third Day Is Added To Air Symposium

A third day has been added to the program of the Third National Air Pollution Symposium originally announced for April 18-19.

The meeting will be held April 18 through 20 at the Huntington-Sheraton Hotel, Pasadena, Calif. It is expected to draw participation from international scientific and industrial interests in air pollution.

Cosponsoring the symposium with Stanford Research Institute are California Institute of Technology, University of Southern California, University of California at Los Angeles, Southern California Air Pollution Foundation and the Air Pollution Control Association of Pittsburgh, Pa.

The program will include sessions on "General Aspects of Air Pollution," "Analytical Techniques and Instrumentation," "Physiological Effects of Air Pollution on Plants," "Physiological Effects of Air Pollution on Animals," and "Legal Aspects of Air Pollution."

General chairman is Dr. A. M. Zarem, assistant director in charge of SRI's Los Angeles Division. Dale H. Hutchison, manager of the Institute's air research section, is program committee chairman.

Grants In Aid

(Continued from Page 5)

research has represented an increasingly larger proportion of the academic budget. Most of this research has been sponsored by the federal government, although industry has also participated. There is fairly general agreement that all parties concerned, the universities, government and industry have benefited from this work. The majority of the investigations, however, have been of an applied nature, with practically all in the physical and biological sciences. Only a negligible amount has been in the social sciences. Thus many worthy liberal arts colleges have been excluded from participating in such research programs.

Since the defense department has been responsible for about 90 per cent of all of the university research sponsored by the federal government it is logical to expect the emphasis mentioned above. In addition, however, there is probably a natural reluctance, admittedly unjustified, to use federal, and also corporate, funds to finance research in the social sciences, the results of which may be controversial. The political and other hazards which could follow are manifest. This attitude is unfortunate since history shows that many unpopular beliefs have later been accepted with the passage of time. Yesterday's heresy frequently becomes today's orthodoxy.

On the other hand, many colleges would hesitate to promote or accept government sponsored projects in the social sciences, even if they were available, for fear of pressures toward conformity so as to preclude findings unacceptable to the majority. The colleges would prefer such research programs to be sponsored by private fundations. Even this course is not without peril, however, as demonstrated by the recent congressional investigations by the Reece Committee.

It is believed that the benefits accruing to industry and education by means of research grants are obvious. Specifically through such programs, industry; obtains knowledge useful to its operations; hires graduates trained in research practices; acquires patent rights; and becomes a better citizen of the community by thus aiding education.

Research grants benefit the university by enabling it to: conduct a better quality graduate program; maintain improved salary scales; enlarge the boundaries of scientific knowledge; train staff members; obtain research equipment and facilities; utilize excess staff and attract desirable faculty members.

What benefits industry and education also benefits the nation. Amongst other things research strengthens our national security, improves our standard of living, and contributes to an enlightened citizenry.

Occasionally problems arise in connection with research grants. In some cases such endeavors: emphasize the recognition of research ability at the expense of teaching ability; remunerate the research professor more favorably than his colleague without a sponsored project; create problems regarding research associates as to whether they should receive faculty status and tenure; sometimes do not bear their full costs and therefore drain university resources; emphasize applied rather than basic research, and physical rather than social sciences; distort the university educational program by accentuating research activities; sometimes restrict publications; and have uncertain continuing support.

Fortunately all of these problems do not occur at the same time on the same project. To the harrassed administrator it only seems that they do. But most institutions have learned to solve them to an extent that they feel that the advantages of research grants far outweigh any attendant disadvantages. I believe I speak for many institutions when I say that this type of support should be encouraged.

Thoughts

The true University of these days is a Collection of Books.

—Carlyle

Criticism is a distinterested endeavor to learn and propagate the best that is known and thought in the world.

—Matthew Arnold

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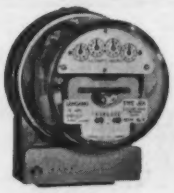

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CRERAR LIBRARY
News and Notes

A sum of $5,000 was made available to the Library in January by the Lenore Schwartz Leukemia Research Foundation. The grant is used to further the work of the Foundation, through publication of *Leukemia Abstracts*. Now in its third year, the *Abstracts* has international circulation among doctors and research scientists, bringing them abstracts of current world literature on leukemia prepared by Research Information Service from more than 2,000 medical publications every month.

* * *

With bookstacks of fixed capacity and ever-growing collections, the Library is continually faced with the problem of housing space. This is met in several ways: through the current disposal program for non-scientific materials, through deposit of less-used items at the Midwest Interlibrary Center, and through more efficient storage procedures. Engineers riding the Library's elevators may have noticed in the fifth floor stacks an installation of drawer-type shelving. An experimental consignment of twelve drawers has been set up by the manufacturer, who claims a space-saving factor of nearly 50%, obtained by utilizing every other aisle. Crerar will make tests of operation and capacity for consideration of a larger installation at some future date.

* * *

For the past three and a half years, the Foreign Operations Administration has contracted with the Commerce Department's Office of Technical Services to conduct a "question and answer program." This is designed to increase productivity in cooperating nations by providing technical information needed in industrial development; sub-contracts are held by several university and research organizations, to which questions are assigned. Crerar, the only library-contractor, played host for the annual meeting of the group on January 17. Discussions of the program and operations took place in the Library, with a luncheon interlude in the WSE dining rooms. Attending were representatives of FOA and OTS, Stanford, Georgia Tech, Battelle Institute, Penn State, Armour Research Foundation, Babson Institute, Arthur D. Little, Inc., and Crerar Library.

Reactor Program Signs 7 Companies

Seven industrial companies have signed as participators in the nuclear reactor research program at Armour Research Foundation of Illinois Institute of Technology, Chicago.

The companies are: Aro Equipment Co., Bryan, O.; Armour & Co., Chicago; Borg-Warner Corp., Chicago; Elgin National Watch Company, Elgin, Ill.; Illinois Tool Works, Chicago; Richardson Company, Melrose Park, Ill., and U. S. Steel Corporation.

Armour Research Foundation plans to construct the nation's first nuclear reactor for industrial research during the coming year. It will be built on the Illinois Tech campus on Chicago's near south side.

Under the reactor plan, each participating firm will make an initial payment of $20,000. In return, the companies will share in the benefits derived from the nuclear reactor research program for three years after the reactor starts operation.

Armour Research Foundation intends to sign at least eight more industrial firms as participators in the program. Cost of constructing the reactor will be in excess of a half-million dollars, one-third of which will be provided by the Foundation.

"We are gratified by industry's prompt acceptance of the nuclear reactor as a new tool for research," declared Dr. Haldon A. Leedy, director of the Foundation.

He said the diversity of the participating companies shows the wide interest in the potentialities of the reactor, and suggests the impact nuclear energy will have on industry.

Construction of the nuclear reactor is scheduled to begin March 15 near State and 34th streets. It is expected to be completed by Oct. 1.

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¡Viva!

Above: A group of well-known members and their wives.

Right: The roving troubadors entertain a group.

Below: The O. G. Smiths' party.

Yes, Sir, cheers for the Mexican Fiesta Party held on Jan. 14 at WSE headquarters. It was a real success! Starting with the social hour at 5:30 p.m., it was fun all the way.

Featured at 6:15 p.m. was the serving of appetizers in the unusual setting of a Mexican street scene. Happy WSE members with their wives and guests sampled such exotic dishes as tamales, mole de quajelote, and tostadas con guacamole.

Dinner, and what a dinner, was served at 7:00. Though the food was American, music by one of Chicago's Mexican-troubador groups added plenty of south-of-the-border zest and atmosphere.

FIESTA

Above: The Bob Bacon party. Below: Fiesta Chairman, Dick Smith and committee members Lois McDonald and Dot Merrill.

Below: Mr. and Mrs. William Koch, and Mr. and Mrs. M. Pollak, partaking of appetizers.

In the main auditorium at 9:00 p.m. there was a special showing of Bob Bacon's beautiful and interesting color movies, "Motoring through Mexico." WSE members and their guests visited, via the movies, a bull ranch at Aguascalientes, the quaint old mining town of Guanajuate, and even watched some fishermen in the unusual occupation of spearing ducks. Of course, interesting Mexico City was included in the tour. Next came Xochimilco's floating gardens, and a garden tour of interesting Mexican homes.

To bring the festivities to a proper Latin-American climax, the movies ended with vivid and action-filled scenes of the bull fight. Exciting, colorful? Indeed! As was the evening.

(Continued from Page 8)

ture of a research reactor. Fortunately, this high flux is obtained at a modest rate of fuel consumption. Even with such economy, the Argonne reactor is surpassed only by our Materials Testing Reactor in Idaho, and we believe that it exceeds, in effectiveness, any research reactor overseas.

Our people estimate that 100 kilograms of uranium 235 is sufficient to provide the critical inventory for 15 such reactors and to keep them in operation approximately five years and still have almost two thirds of the fuel inventory unconsumed.

These 15 reactors would multiply many times the research reactor capabilities of the free world, excluding the United States. Each of them could produce more radioisotopes of varied types than are presently needed by Holland or Switzerland or Belgium or, for that matter, any country in the world.

One of the most important assets of this tool is its versatility. The high neutron flux created inside the octagon-shaped reactor is employed by placing objects to be irradiated into one of the more than fifty apertures which penetrate its eight sides and top. By using just one of these more than fifty access holes, a radioactive cobalt source of, say, a thousand curies could be made each year. This would be equivalent to 1000 grams of Radium which used to sell for $30,000 per gram. All of you must have heard of the use of radio-cobalt as a gamma ray source in combatting cancer.

Irradiation of one ounce of gold, which would occupy a very small part of the available space in another of the pile apertures, would provide enough radioactive gold, when placed in colloidal suspension, to treat many scores of patients for malignancies. And even the spent fuel elements from this type reactor have valuable service to perform. They can be placed into a facility so that the gamma radiation which they emit can be used for the pasteurization and sterilization of foods. For instance, such a facility would kill the trichinae in pork and it is believed will preserve other food products for extended periods.

Carbon 14, a radioactive form of carbon, can be produced in such a nuclear reactor. This isotope has proved to be extremely useful in biological research because all living organisms, plant and animal, are composed of 30 to 40 per cent carbon. Plants are being grown in specially designed greenhouses in which the air is arranged to contain enriched amounts of carbon 14 in the form of carbon dioxide. All of the carbon compounds, sugar, amino acids, proteins, and fats formed by the plants grown under such conditions are radioactive. This technique is being used in connection with a currently much debated subject. Tobacco plants have been used to produce radioactive cigarette tobacco compounds. These are employed as tracer tools in medical studies to further our knowledge of the effects of tobacco on the organism. I am sorry that there are as yet no final results with which to enlighten those who, like myself, enjoy smoking.

The CP-5 type reactor can also be used for radiation physics measurements; studies of the nuclear properties of matter; reactor engineering experiments to develop better materials and instruments for future reactors; and for medical therapy, both by direct use of external beams and by producing sources for such use elsewhere. Such reactors can also be training centers for the education of new operators and scientists to advance nuclear technology. We have already noted that they can be producers of radioisotopes for uses too numerous to mention.

But the most remarkable point to remember is that just one of these reactors will put a country into business in all of these fields. And lest you think that such a versatile piece of equipment as the CP-5 reactor is fabulously expensive, the total cost (exclusive of fuel and moderator) for the reactor, the reactor building, and the associated laboratories is only about 2¼ million dollars. It might be considerably less expensive in countries where construction costs are lower. Some types of research reactors may indeed be built for sums measured in hundreds of thousands rather than millions of dollars.

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I have consumed so much of your time with this major item on the credit side of our balance sheet that we can only glance momentarily at other industrial uses. One of my colleagues a few weeks ago calculated that these uses were already saving American industry a hundred million dollars annually. This results from applications in thickness, quality and wear gauging and control devices, in pipeline and cracking plant applications, in gamma-ray radiography of castings to locate flaws, in fertilizer and insect controls, in catalytic functions—the list is long and is growing almost daily as new applications are discovered. Under the new Cole-Hickenlooper Act, native American inventiveness will in five years be free to develop in the atomic energy field almost as easily as in other areas, and we can look for even more momentum to develop as that day approaches.

When the Commission began eight years ago, atomic energy was not only a Government monopoly but a military province with no early promise of large-scale peaceful application. Eight short years have seen a phenomenal change. American industry has moved into the field with boldness and resolution and with confidence based upon the sound technology of many resourceful research organizations. I believe that the next eight years will bring an accelerating increase in both discovery and application. We are just at the early dawn of the new age and if we can find the means of avoiding war, we will go forward into a period of prosperity and good works such as men have never witnessed nor scarcely even imagined.

Ramey Is Appointed Professor at MIT

Dr. Robert A.. Ramey, Jr., manager of the Magnetic Development of the Materials Engineering Department of the Westinghouse Electric Corporation (Pittsburgh), has been appointed Visiting Webster Professor of Electrical Engineering at the Massachusetts Institute of Technology for the second semester of the current academic year.

The Webster Chair of Electrical Engineering at M.I.T. was established in 1952 under a grant of $400,000 from the Edwin Sibley Webster Foundation in memory of the late Mr. Webster, one of the Institute's most distinguished alumni.

In making the announcement, Professor C. Richard Soderberg, dean of the School of Engineering, said that during his stay at M.I.T. Dr. Ramey will participate in the development of teaching and research in the new area of solid state non-linear devices and their applications to power modulators. Dr. Ramey's appointment became effective Feb. 1.

Armour Completes Automation Catalog

A necessary step to the widespread use of automation—the cataloging of available automatic data recording equipment—has been completed by electrical engineers at Armour Research Foundation of Illinois Institute of Technology, Chicago.

The result of the Foundation's compilations, which began last June under Air Force supervision, is a 74-page booklet that describes the operation and manufacturers' specifications of 70 data recording instruments.

A need for the catalog arose because of a lack of information on such equipment manufactured by more than 50 different companies, according to Albert K. Hawkes, research electrical engineer in charge of the project.

The booklet, "A Catalog of Devices Useful in Automatic Data Reduction," provides such a clearinghouse for governmental agencies and industry using miscellaneous automatic devices, he said. It will have Air Force-wide distribution.

Complimentary copies of the catalog also will be sent to manufacturers who cooperated in the compilation, Hawkes said. The catalog, he added, will be revised periodically, with first revision to be published in January, 1956.

The data equipment project also surveyed eight laboratories at Wright Air Development center, Dayton, Ohio, to determine specific needs for standardization of test recording equipment.

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OVER THE MANAGER'S DESK

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C-2550 (a) PLANT MANAGER Age: 40-55. 5 plus yrs. exp. in plant management at top level covering both mass & job shop steel & metal fabrication. Knowledge of planning and controlling all phases of mfg. Duties: assuming all resp. for factory operations, industrial engrg., production and material control, quality control, purchasing and plant engrg. For a mfgr. of auto heaters. Sal: $15,000-$20,000 per yr. Loc: Indiana.

C-2555 (a) INDUSTRIAL ENGINEER IE or ME. Age: Up to 32. Recent grad. or better (2) otherwise 2 plus yrs. exp. draft exempt. Knowledge of steel mill operations. Duties: learning steel mill management by taking time studies, developing data, incentives, plant layout, etc. For a steel manufacturer. Sal: $380-$500 per month. Loc: South Chicago.

C-2555 (b) METALLURGIST Met or Met. Eng. Age: Up to 32. Recent graduates or better. Knowledge of steel mill operations desirable. Duties: training for management work in steel mills. For a manufacturer of steel. Sal: $380-$425 per month. Loc: South Chicago.

C-2562 FIELD ELECTRONIC ENGR. EE or Physicist or Electronics. Age: 25-45. Must be U. S. citizen. 3 plus yrs. exp. in commercial electronic exp. in application work. Knowledge of electronic eqpt. Duties: field application service & engrg. of electronic equipment of audio or communications nature. For mfgr. of elec. eqpt. Sal: Up to $650 per mo. depending on exp. Travel: 30% to 40% of time. Loc: Wide open.

C-2565 SALESMAN Electronics' schooling or training. Age: 27-35. 2 plus yrs. exp. in sales or application of electronics equipment. Duties: selling line of electrical testing equipment to industrials and electronic distributors. For a manufacturer of electrical equipment. Sal: $6000-$7000. Employer will negotiate fee. Some traveling. Car required. Loc: Chicago.

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Ozone Promises Much for Future

Increased commercial use of ozone . . . Chemical reactions conducted in a manner now generally unknown . . . Increased glamor for already glamorous plastics.

These are promising prospects in the field of chemistry that the public can anticipate in the next few years, according to four specialists at Armour Research Foundation of Illinois Institute of Technology, Chicago.

Clark E. Thorp, manager of the chemistry and chemical engineering research department, cited two reasons for his prediction ozone will be utilized in increasing quantities by industry:

—Valuable because it is one of the most powerful oxidizing agents known, ozone now can be produced and safely handled by Foundation scientists in any concentration up to and including 100 per cent.

—Ozone prices have been reduced so that it is available in large quantities at reasonable cost. Thorp said ozone has interested researchers for a long time, but the cost up to now has been prohibitive for commercial purposes.

Foundation scientists are continuing research to further reduce the cost of ozone, he explained, pointing out it currently is available in 2 per cent concentrations in tonnage quantities for 18 cents a pound.

In addition to its uses in sterilizing water and purifying air, ozone more recently has been used in organic synthesis, especially by drug firms manufacturing pharmaceuticals, Thorp said.

Chemists currently are interested in two types of reactions which may make it possible to conduct other reactions now difficult to promote, according to Raymond A. Erickson, supervisor of the chemical engineering section in the Foundation's chemistry and chemical engineering department. These are the electronic discharge and jet flame reactions.

The principles behind electronic discharge reactions, Erickson stated, have been under study at the Foundation for 14 years.

Here's how the reaction operates, according to Erickson. A stream of electrons under controlled energy conditions is passed between a couple of electrodes in an enclosed area. Chemicals in the form of a gas are passed through, and the electricity causes them to split up or become activated into atoms or activated molecules. Special design of the reactor is made to feed the atoms and molecules back together again to form new chemicals important in organic chemistry.

The technique, explained Erickson, has been made adaptable to several reactions where electricity can be used to activate molecules entering into reactions.

Jet flame reactions seem to have real possibilities, Erickson said, such as in the formation of acetylene, ethylene, and other unsaturates, and aromatic-type compounds.

The reactants are compressed in the incoming turbine blades to a high pressure and then burned in the combustion tubes. The products go out through the exit turbine blades to keep the process continuing.

Plastics research soon may result in rubber tires capable of 'outliving" automobiles, said Ed Swire, assistant supervisor in charge of the plastics and rubber section.

Another development in polymer plastics, he said, will be shoe soles which can wear indefinitely. Other extremely durable rubber materials with a wide range of applications are good prospects for the future, although there still are many technical problems to solve, Swire added.

Dr. Fritz Rosenthal, research plastics chemist at the Foundation, predicted that increasingly larger items, such as television cabinets, will be molded from plastics. Smaller items already have gained consumer acceptance, he stated.

Adhesives constitute another promising plastics area, according to Rosenthal. He said it will be possible to bond together almost any material a person can think of—metal to metal, metal to plastic, or metal to glass. He further predicted adhesives will be capable of bonding together aluminum for use in aircraft construction.

Sponge with densities ranging from two to 20 pounds per cubic foot also will be available for insulation in aircraft and buoyancy materials in boats, he contended.

On Culture

Culture is "to know the best that has been said and thought in the world."

—Matthew Arnold

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WSE Applications

In accordance with the By-Laws of the Western Society of Engineers, the following names of applicants are being submitted to the Admissions committee for examination as to their qualifications for admission to membership into the Society in the various grades, i.e., Student, Associate, Member, Affiliate, etc. All applicants must meet the highest standards of character and professionalism in order to qualify for admissions, and each member of the Society should be alert to his responsibility to assist the Admissions committee in establishing that these standards are met. Any member of the Society, therefore, who has information relative to the qualifications or fitness of any of the applicants listed below, should inform the Secretary's office. The Secretary's office is located at 84 East Randolph Street. The telephone number is RAndolph 6-1736.

119-54 Russel C. Dahl, Development Engineer, Joslyn Manufacturing & Supply Co., 3700 S. Morgan St.

120-54 Harold F. Burgart, Assistant Engineer, Northern Illinois Gas Co., 615 Eastern Ave., Bellwood, Ill.

121-54 William R. Cress, District Manager, Ohio Brass Co., 231 S. La Salle St.

122-54 Robert A. Harper, Design & Engineering, The Peoples Gas Light & Coke Co., 122 S. Michigan Av.

123-54 Glenn C. Hillesland, Engineer I, Commonwealth Edison Co., 22 W. Cass St., Joliet, Ill.

124-54 Edward A. Michalek, Senior Engr., Distribution Design, The Peoples Gas Light & Coke Co., Co., 122 S. Michigan Av.

125-54 Alex C. Alexander, Engineer I, Commonwealth Edison Co., 22 W. Cass St., Joliet, Ill.

126-54 Richard W. Geaney, Central District Engr., General Cable Corp., 337 W. Madison St.

127-54 Fred H. Johnson, Asst. to Vice President, Steel Mfg., Inland Steel Co., East Chicago, Ind.

128-54 Nathaniel G. Kamen, 7648 N. Eastlake Terrace.

129-54 Bonnell H. Allen (Trsf.); Manager, Chicago Office, Engineering Societies Personnel Service, Inc., 84 E. Randolph St.

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Management Is To Be Studied

A challenging and rigorous examination of fundamentals which underlie sound industrial management awaits a group of young executives who will study in the Executive Development Program at the Massachusetts Institute of Technology in 1955-1956.

The national competition for Sloan Fellowships to attend this year-long program opened at M.I.T. on Jan. 3. The awards are considered among the high honors which can come to young men entering on executive responsibilities in American industry.

Edward P. Brooks, dean of M.I.T.'s School of Industrial Management, who announced the fellowships for next year's program, pointed out that, because the Executive Development Program extends over a full year, it achieves a breadth of coverage and degree of penetration into fundamentals which are impossible in a shorter space of time.

"The experience of the men who have participated in this program over the past 20 years indicates that it was wrought a profound change of vision and effectiveness," Dean Brooks explained.

"The men—and their companies—confirm that this 12-month experience has enhanced their ability to work effectively with people and has strengthened their sense of long-range affiliation with their own companies and with the objectives of a free-enterprise economy.

"Among the total galaxy of abilities, motivations and experiences that will constitute the background of tomorrow's successful managers this program can contribute especially to the continued habit of growth and to a breadth of view and grasp of fundamentals that contribute to competent and confident approaches to problems as yet unsolved," said Dean Brooks.

Fellowships will be awarded to 30 to 35 young executives for work at M.I.T. next year. These Sloan Fellows will be organized into two groups of 15 to 18 men each.

Each Sloan Fellowship carries with it a financial award which helps to defray a portion of the costs of participating in the Executive Development Program. Each candidate for a Sloan Fellowship must be nominated by his employer and have from his employer the promise of financial support during the year.

The Sloan Fellowship awards are made possible by financial support from the Alfred P. Sloan Foundation, Inc., which also makes funds available to help meet M.I.T.'s costs in devoting major educational resources to the Executive Development Program.

Professor Gerald B. Tallman, Director of the Executive Development Program, invites employers to nominate men for participation in the Executive Development Program as Sloan Fellows. Applications are due by March 4, 1955.

"Each nominee," says Professor Tallman, "must be a man whose promise for future service is so great that it justifies finding a way to release him from his job for a full year of study in order to assure the maximum breadth and soundness of his development.

"Nominations are welcomed from both large and small companies, and from a variety of industrial and other business backgrounds. Companies should base their choice of men for nomination on a rigorous appraisal of the quality of the nominee's accomplishments to date and their ability and opportunity to grow into major business responsibilities.

"In the final selection of Sloan Fellows from among nominations, M.I.T. will attempt to evaluate each nominee's potential for growth into major responsibilities; there is no rigid requirement of a particular background. Thus men from all types of enterprise and experience are invited, though we continue to feel that engineering provides a very excellent background for management in our technically complex economy."

The program of study in the Executive Development Program is designed especially to help members of the program widen their horizons and deepen their understanding of the environment of industry. When participants return to their companies, Professor Tallman believes, they will know more thoroughly how the demands of production, personnel, marketing, financial control, all fit

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into a total operation. "They will," he says, "be able to make decisions that affect seemingly unrelated aspects of the organization, and they will understand the point of view of men in other industries and in government with whom they must deal."

Members of the 1955-1956 Executive Development Program will be in residence at the Institute in Cambridge for 12 months beginning June, 1955. Each is expected to move his family to Boston for the year.

For the first few months of the program the Sloan Fellows undertake a preliminary study of management and economic problems as their first exposure to the organized examination of these fields. During the fall and spring of the 1955-56 academic year they study intensively such subjects as management operations (accounting control, marketing and production), finance, industrial relations and public policy, human relations, administrative policy, pertinent social sciences (foreign policy, law, industrial change and industrial history), and management theory.

In addition, there will be a series of technical seminars at which members of the M.I.T. faculty in science and engineering discuss with Sloan Fellows new developments in these fields.

Throughout the regular academic year members of the Executive Development Program meet each week for dinner and evening seminars with a business leader who is substantially senior to them and to their normal associations in industry.

Three week-long field trips to the Middle West, to New York and to Washington are planned during the academic year. These trips make possible personal visits to managements of companies in many fields of activity and to government officials who are responsible for Federal policies affecting all phases of the nation's economy.

Complete information on the Executive Development Program and application blanks for Sloan Fellowships may be obtained from the director of the Executive Development Program, M.I.T. School of Industrial Management, 50 Memorial Drive, Cambridge 39, Mass.

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Lumber Association Awards Scholarships

The National Lumber Manufacturers Association will award special scholarships again this year to four outstanding college students majoring in wood utilization or wood technology, NLMA executive vice-president Leo V. Bodine announced Jan. 20 in Washington, D. C.

The scholarships will enable each student to take ten weeks of summer training in wood products research at the laboratory of the Timber Engineering Company—research affiliate of NLMA. Each scholarship winner will receive a cash award of $500 to defray his expenses during training. The students also will be paid travel expenses to and from Washington, D. C., site of the TECO laboratory.

This is the sixth year of the NLMA scholarship program, designed to encourage more of the nation's top students to seek jobs in the private wood industries.

The four scholarship winners will be chosen on the basis of their scholastic ratings, general aptitude and the recommendations of their schools.

The deadline for nominations is March 15. The scholarship winners will be announced on April 15. The ten weeks of summer training at the TECO laboratory will begin June 27 and end September 2.

One senior or graduate student from each school offering a course in wood utilization or wood technology is eligible for nomination by his dean or department head.

The TECO laboratory, dedicated to improving and expanding the use of lumber and wood products, conducts performance tests and other research studies for lumber and wood products manufacturers, allied industry groups and various government agencies.

On Books

Some books are to be tasted, others to be swallowed, and some few to be chewed and digested.

—Bacon

On Training —
Letters from Leaders

In the last issue of Midwest Engineer we published another of about thirty letters received from leaders of Chicago-area firms concerning shortcomings noted in the engineers in their employ. Many of the letters also suggested what the engineers should do to correct their deficiencies.

Significantly, the engineer's technical training is generally considered adequate. In the broad area of Human Relations, however, engineers seem often to be "under achievers," according to the viewpoint of the industrial leaders as reflected in their letters.

We are printing another of these letters in this issue, as we shall do in future issues. Although the letters may be of greatest value to the younger engineers, we hope that all of the engineers who read them will benefit.

Here, then, is the next letter:

Dear Mr. Becker:

As advised your office on the telephone, this is the writer's first opportunity to respond to your letter of August 31 to Mr. ....., President of ..... and ..... pertaining to the educational needs of engineers for properly equipping them either as supervisors in engineering work or for executive positions.

Your questions provoke a very much worthwhile analytical appraisal of the engineers' position and performance in business.

In an industrial organization it is important that the engineer learn, as early as possible, that engineering is a service extremely important but subordinate to the sales and production requirements of the particular industry served. Accordingly, it is important that the engineer acquire a thorough knowledge of the industry which he serves. Engineering is economic and recommendations should be made to conform to the economic justifications and requirements. Younger engineers are often inclined to view the engineering design or project as an independent unit, without regard to alternate or less costly designs that could serve equally well.

Technical engineers generally are not adequately trained to become supervisors of larger groups of people. With the technical knowledge at the command of engineers combined with greater supervisory and executive training, engineers could become even more effective than they are today. Along with supervisory training there goes hand in hand a need for learning to get along well with people whether or not they are engineers who can appreciate the technical worth of recommendations which are made.

An important qualification is to logically and effectively present and convince executives with regard to engineering recommendations. Engineers often do not give sufficient study and thought to the preparation and form of engineering reports and recommendations which, properly presented, go a long ways in establishing confidence and selling the project.

A very consequential stewardship is vested in the engineers by industry today for engineering methods, equipment, construction, design, capital and investment costs and safety of structures and operations and it behooves engineers to be prepared to assume these responsibilities and handle such work in a logical, constructive and effective manner. Engineers have often been prone to be timid, backward and ineffective in assuming such responsibilities.

With the success which industry has made in our generation through the effective functioning of engineers it would be most unfair to find basic fault with engineers and their conduct. However, from the standpoint of the individual and his training and preparedness, even greater progress should result if the engineer is able to more effectively project himself into the industry which he serves.

Trust that the above brief comments may have some value in the investigation and report which you have under way.

Sincerely yours,
(signed)

Selective Service Is Subject of Comment

Drafting a new selective service law will afford an opportunity to end what has been "only a vacillating policy" toward engineers and scientists, in the opinion of Dr. Roger Adams, former head of the department of chemistry and engineering of the University of Illinois.

Dr. Adams expressed his views in a statement received Jan. 26 by sponsors of the Military-Industrial Conference on Utilization of Technical Manpower being held in the Conrad Hilton hotel Feb. 10 and 11. They said that as a past president of the American Society for Advancement of Science and a leader in

chemical warfare in both world wars, his opinion was sought to guide the conference in drawing up recommendations to Congress on the new draft law.

Dr. Adams' statement in full follows:

"Members of the professional staffs of the universities and colleges engaged in teaching and research in technical subjects have been continuously disturbed during the past eight years with the operations of selective service as applied to engineers and scientists. The recommendations of those most intimate with the shortage of engineers and scientists and their value to the national economy and defense have been ignored.

"The authority in Washington who has had the greatest influence in guiding the decisions of the local selective service boards has shown distaste and disregard for scientific manpower. Political expediency has prevailed. Only a vacillating policy toward engineers and scientists has been followed. Some students of these subjects have been allowed to complete their training; others have been inducted into military service before they finished; in practically all cases these men have been called to serve in the armed forces for two years regardless of whether effective use can be made of their previous training. Very little consideration has been given to the importance to the country of their work in civilian life.

"The technical competence and achievements of the United States, of which we are all proud, are dependent in large measure on scientists and engineers. The decline in recent years of their relative numbers and effectiveness deserves the careful consideration of civilian and government agencies.

"With a new selective service bill now being formulated, every effort should be made to prevent what has happened in the past. The directives in the bill should be flexible but so worded that no individual may have the power to interpret and essentially to define the policy with respect to scientists, engineers, or any other professional class of citizens.

"Of all the leading countries of the world, the United States is the only one in which no special attempt has been made to conserve scientists and engineers as essential to the country's economic welfare and defense."

E. E. Education at MIT To Undergo Revision

A grant of $50,000 from the General Electric Educational and Charitable Fund to aid in a fundamental revision of undergraduate electrical engineering education at the Massachusetts Institute of Technology was announced by Professor C. Richard Soderberg, dean of engineering, on Jan. 8.

The grant will aid Dr. Gordon S. Brown, head of the Department of Electrical Engineering, to develop stimulating new instructional methods, materials, and techniques based on new concepts of teaching electrical engineering.

In announcing the grant Professor Soderberg said:

"The Institute's department of electrical engineering has a long record as a pioneer in developing educational methods in its field. From its early beginning as an option in physics in 1882, it awarded the first degrees in electrical engineering in the country in 1885. It was established as a department in 1902. Revision of the curriculum now calls for a break with tradition in every instance in which methods based on the heritage of the past no longer keep pace with or anticipate fundamental advances in the progress of modern science and engineering.

"As a result of studies under the direction of Dr. Brown, plans are going forward for a revitalized undergraduate curriculum. We expect this project to result in a manpower development program for the education of resourceful young engineering-scientists with finer technical skills and broader professional vision for the creative exploitation of modern science.

"The grant indicates forward thinking on the part of one of the nation's leading enterprises in electrical engineering and a willingness to participate in a significant experiment in professional education. This close relationship between industry and education lends particular significance to this grant.

"Dr. Brown is working on this revision with the conviction that during their educational period students should be constantly confronted with the problems of tomorrow as well as the problems of today. It will be his aim to establish a unique system of classroom and laboratory instruction which will integrate a broad understanding of the fundamentals of modern science and the creative ability to make the transition from the classroom to professional practice more effective than ever before.

"New teaching materials designed to bring to students an early appreciation of the wide range of scientific fundamentals and their application in terms of function will be an important goal in the new curriculum. These subjects include the conversion and control of energy, energy radiation, the processing of information, modulation and amplification. Emphasis will be placed on entirely new laboratory instruments and equipment designed to stimulate instruction in the bold and imaginative exploitation of energy and new materials as well as in new devices. The plan calls for laboratory instruction which breaks with tradition to bring a new dimesion of creative development in undergraduate education."

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Reviews of Technical Books

Welding

Welding for Engineers, by Harry Udin, Edward R. Funk and John Wulf, John Wiley & Sons, New York, N. Y., 1954, 430 pages. Price $7.50.

This textbook is intended for use as an introductory course in welding for undergraduate engineers of various fields. It contains a discussion of numerous welding processes including cold welding, hot pressure welding, resistance welding, fusion welding, and braze welding. There are also chapters on the metallurgical and mechanical effects encountered in welding and the principles of weld inspection and testing. This text is complete with a group of review problems, a glossary, and documentary and supplementary reading references.

In this book, welding engineering is treated as a field in itself instead of a part of other engineering fields. The authors have emphasized the principles of welding, the complexity of which makes it necessary to draw on the advanced principles of various other sciences. To a casual reader this may not make for easy reading but to the student it should not be difficult to comprehend. The unit processes are presented as soon as possible after its basic principles have been developed. As an understanding of the unit processes is acquired, more complicated processes are presented for illustration.

The use of the analytical approach to the fundamentals of welding is effective even though many of the analytical developments are idealized or are too incomplete to be of much value in solving problems in applied welding engineering. It is believed that this book will provide interesting reading for anyone involved in this field and will stimulate many students to do advanced research in the field of welding.

JSC-WSE

Electricity

Electricity—Direct and Alternating Current, by Charles S. Siskind, McGraw-Hill Book Company, Inc., New York, N. Y., Second Edition, 1955. 538 pages. Price $5.75.

This is a textbook for technical high school students, and for college students outside of the electrical engineering curriculum. It was first published in 1947 under the title *Electricity—Principles, Practices, Experiments.* The plan of the author, a professor at Purdue University, is to explain the principle, show how it works in circuits and electrical machines, and let the student "do it himself" in simple experiments. There are 43 of these experiments.

The book begins with the basic ideas and effects of electricity, and the electrical properties of conductors, and follows through with the basic laws and theorems of direct current.

Following each of these beginning chapters, and every chapter in the book, is a point-by-point summary of the material covered, a comprehensive roster of questions based on the chapter, and a series of problems that vary in difficulty so as to be suitable for high school and college level students.

Chapter 5 introduces the student to alternating current circuits, power measurement, and power factor adjustment. The author discusses the principles of magnetism and electromagnetism to prepare the way for a treatment of material on direct current measuring instruments, induction, and transformers. The final chapters, 9 and 10, deal with generators and motors in detail, including modern single-phase and polyphase a.c. motors.

There is a chapter-by-chapter catalog of appropriate motion pictures and film strips about electrical principles and machines at the end of the text and an appendix containing brief histories of major electrical discoveries and developments.

J.C.B.

Prestressed Concrete

Prestressed Concrete, by Gustave Magnel, McGraw-Hill Book Company, Inc., New York, N.Y., Third Edition, 1954. 345 pages. Price $8.00.

This book, in its 3rd edition since 1948 in a rapidly developing field, is being published in the United States for the first time. The author is Professor of Reinforced Concrete, and Director of the Laboratory at the University of Ghent, Belgium.

The book is written for engineers by a practicing engineer. The principles and theories are there but most of the book draws on the results of tests and actual construction. More than a dozen methods of prestressing, including the author's own, are described. These methods come out of several countries including the United States.

The author presents a method of making calculations for statically determinate prestress concrete members of any shape under different bending moments and shearing stresses. Continuous structures are dealt with next. This chapter describes a simple method of design and gives examples of actual construction. Succeeding sections of the book discuss the problem of creep in both steel and concrete, and how to avoid buckling of beams during prestressing.

The final pages of the book are devoted to some 60 examples of bridges, buildings, and other structures built in prestress, most of them under the design and construction supervision of the author, and a discussion of the adaptability of prestressed concrete products to production line manufacture.

J.C.B.

H-AC Engineers To Meet June 27-29

The Semi-Annual Meeting of the American Society of Heating and Air-Conditioning Engineers will be held June 27, 28 and 29 in San Francisco.

In making this announcement, ASHAE president L. N. Hunter added that Samuel W. Terry of the San Francisco Golden Gate Chapter had been appointed general chairman of the committee on arrangements, and that Terry has completed filling the chairmanships of the many subcommittees responsible for the success of the meeting.

Beginning Monday morning, June 27, following the usual order of business, there will be a technical session. Other technical sessions will follow on Tuesday and Wednesday.

Terry has announced that H. Duncan will serve as vice chairman and that G. M. Simonson is honorary chairman. The toastmaster for the banquet will be Dr. B. N. Woods, vice president, University Extension, University of California.

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WSE Personals

The retirement of **R. D. Wood,** MWSE, Chicago, as chairman of the board of Mississippi Valley Structural Steel Company, which operates plants at Decatur, Ill.; St. Louis, Mo.; Chicago, Ill., and Flint, Mich., has been announced. A former president of the company, Wood has served as chairman of the board since 1948. He will continue as a member of the board of directors and finance committee.

J. Bruce Butler, St. Louis, formerly president, was elected chairman and head of the company.

E. T. Blix, MWSE Chicago, formerly executive vice-president, was elected president.

Three other Chicagoans continue as officers of the company: J. C. Arntzen, vice-president; E. D. Prescott, secretary, and A. E. Myers, assistant secretary.

* * *

Hungerford & Terry, Inc., Clayton, N. J., manufacturers of water conditioning equipment, announce the appointment of Ross Engineering, 224 South Michigan Avenue, Chicago 4, Ill., as their representative in the Northern Illinois, Eastern Iowa and Northwestern Indiana territory.

Herman M. Ross, MWSE, of Ross Engineering, is a graduate of Illinois Institute of Technology and has many years of experience in water conditioning. He is considered particularly well qualified to handle the sale and servicing of Hungerford & Terry's popular line of water conditioning equipment in the Chicago area.

* * *

At the annual meeting of the Illinois Engineering Council held recently in

Chicago, **W. R. Marston,** treasurer of WSE and deputy traffic engineer for the City of Chicago, was elected president for 1955. The Council is composed of directors from 16 Engineering Societies throughout the state, which represents over 12,000 engineers.

Other officers and their affiliated societies are: Ellis Danner, first vice-president, director from American Association of Engineers; **Daniel K. Chinlund,** MWSE, second vice-president, director from the Chicago Section of the American Institute of Electrical Engineers; and **John G. Duba,** MWSE, secretary-treasurer, director from the Illinois Society of Professional Engineers.

Members of the Executive Committee are: John A. Harrington, director from the Illuminating Engineering Society; **E. R. Hendrickson,** director from the Western Society of Engineers; and J. S.

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Martin, director from the Central Illinois Section of the American Institute of Electrical Engineers.

The purposes of the Council are to further the public welfare wherever technical and engineering knowledge and experience are involved, and to consider and act upon matters of common concern to the Engineering and Technical professions.

* * *

Three members of the American Society of Heating and Air-Conditioning Engineers, who have attained the distinction of 50 years or more continuous membership in the oldest engineering society in its field, were appropriately honored during the 61st Annual Meeting of the Society held in Philadelphia January 24-27, 1955. L. N. Hunter, ASHAE president, awarded scrolls marking this important milestone in their professional careers. The award was made at the annual banquet, Jan. 26, which was attended by approximately 1,300 members and guests.

The members cited are **Samuel R. Lewis,** MWSE, Chicago; Henry C. Meyer, Jr., New York City; and William R. Stockwell, Michigan City, Ind. The wording of the scrolls expresses appreciation for their longevity of membership, credit to the profession, and loyal support of the Society.

Lewis, a member since 1905 and a founder of the Illinois Chapter, served as Society president in 1914 and was a member of Council 1914-1915. Born in 1878, he has been active in the profession since his youth, and is the author of many books and technical papers related to the profession.

Mr. Meyer joined the Society in 1898 and served on the Council in 1915-1916. Born in 1870, he has worked on numerous buildings throughout the country including the Empire State Building, Yale University and the U. S. Military Academy at West Point. In 1934 he established the firm of Meyer, Strong and Jones, Inc., in New York.

Retired in 1949 as the general manager of the manufacturing division of the Weil-McLain Co., Mr. Stockwell has been active in the profession and industry for many years and has been a member of the Society since 1901. Born in 1875, he was with the old J. H. McLain Co. prior to its succession by Weil-McLain.

* * *

Samuel R. Lewis, MWSE, consulting mechanical engineer, Chicago, was honored as the first 50-year member of the American Society of Heating and Air-Conditioning Engineers at the Illinois Chapter Meeting in the Merchandise Mart on Jan. 10, 1955. George Zintel, president of the Illinois Chapter, introduced **John W. James,** MWSE, 2nd vice-president of the Society, to present a scroll to Lewis and to review some of the highlights of Lewis' career in his 50 years as a member of the Society. Lewis was one of the 14 members in the Chicago area that initiated the founding of the Illinois Chapter, the first chapter of its kind, in 1906. The second chapter was not founded until 1911 in New York. Lewis was president of the American Society of Heating and Ventilating Engineers in 1914 after becoming one of the national authorities in heating and ventilating school buildings. He was the ninth recipient of the F. Paul Anderson award from the ASHVE in 1951. James pointed out in presenting the scroll to Lewis that the presentation of the scroll which salutes Samuel R. Lewis is the first presentation of its kind. Zintel presented a gold desk set to Lewis from the Illinois Chapter for his continued interest in the activities of the chapter.

Lewis spoke about his early experiences in the Society and about the problems of heating and ventilating large buildings in the past 50 years.

He told of the Paul systems which followed the two-pipe steam systems with and then dry returns or more commonly called vapor systems. Paul was also an early suggestor of the application of radiant heating.

He traced the development of steam traps to the point when they became the heat-sensitive type. The development of the vacuum pump was also cited.

Lewis said that when the Illinois Chapter was founded in 1906, the rat-

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ings of fans, boilers and radiators were fantastic. He made a study of cast-iron sectional boiler ratings about 1910 and published the results. The variations in ratings of boilers by competitive manufacturers were most startling and bore little consistency to the heat absorbing surfaces, or to the efficiency of the interior water circulation or even to the grate area. Eventually, the Institute of Boiler and Radiator Manufacturers and the National Association of Fan Manufacturers published ratings by their members which had been based upon competent tests.

Chicago schools were heated by all-indirect fan systems, usually with boilers operated at about 100 pounds steam pressure. The fans and pumps were run by steam engines and the exhaust steam was condensed in the blast coils. Mr. Waters, perhaps the first Chicago Board of Education engineer, developed a special cast-iron two-compartment box for the blast coils, supporting vertical 1-inch steam pipes, around which the air passed on its way to the school.

Today, most ventilating systems are designed with a means of removing part of the dust and soot that enters with the air from out of doors. Lewis said that he does not remember much about air filters in 1908, except that coarse pieces of coke were held by wire screens across airways and were sprayed with water. This scheme was not successful. A German engineer, Wittermeir, invented some screen pockets of close mesh that supported hundreds of little metal ferrules like those that hold the eraser on a wooden pencil. There ferrules were coated with an oil-like substance, and it was found that the air forced around these ferrules lost most of its dust. This was the grandfather of the air filter of today. It proved the principle that dust, much like snow, will fall out of a wind-eddy leeward of an obstruction.

Lewis concluded his discussion by citing the many changes that have been made in the terminology relating to the heating and ventilating engineering profession, but that more changes were needed to further clarify and identify terms and pieces of equipment used.

Airmen to Get Safer Windshields

Safer, ice-free aircraft windshields now are being built as the result of a four and one-half year research program concluded recently at Armour Research Foundation of Illinois Institute of Technology, Chicago.

The project was sponsored by the Wright Air Development center, Dayton, Ohio, so designers could specify failure-proof windshields that would never shatter, but only crack under the worst military and climatic conditions.

Two of several important developments resulting from the project were released by William T. Savage, supervisor of the materials engineering section, and Joseph S. Islinger, associate research engineer, both at the Foundation:

1. A system was developed for measuring over-all optical quality of windshields as they were affected by imposed laboratory conditions. The system employs a rectifying plate that corrects for distortion directly, thus alleviating the necessity of mathematical corrective calculation after test photographs are made.

2. A windsheld mounting employing a synthetic fiber cloth was developed. The fiber, replacing aluminum in some applications, improved stress isolation of the windshield, necessary in conditions of intense airframe distortion and vibration.

Most of the research was undertaken to find a pressure-proof, distortion-free, anti-icing windshield that would be satisfactory for global operation, Savage and Islinger said.

One experiment sought to keep the temperature on the outer surface of the windshield at about 40 degrees F. to prevent ice from forming.

In others, the Armour Research Foundation scientists had to consider air friction, evaporation, thermostatic arrangements for controlling the heat, stresses, and other complex factors.

Safety also entered the picture in the case of pressurized cabins or cockpits.

In order to establish design limits for concepts determined throughout the program, Armour Research Foundation engineers simulated flight conditions, putting their windshields through vigorous tests.

Experimental models were subjected to low temperatures, thermal shocks such as encountered in flying into a super-cooled cloud, stresses caused by the heat input in de-icing, more stresses induced by cabin pressurization—still others due to airframe distortion, speed, or air gusts.

To perform many of the tests, special heat transfer and stress equipment had to be devised. Often, according to Savage and Islinger, water was used as the heat transfer medium instead of air because it is easier to control and regulate.

The stress analysis studies were similar to those used by industry to achieve stronger, lighter machine parts.

In one test, alcohol, cooled to 90 degrees below zero F., passes across one side of a pane of glass. Heat, supplied electrically, is stepped up slowly on the other side until the temperature rises to about 500 degrees F. and the glass cracks —like a milk bottle breaking when filled with boiling water.

Although windshields never may meet these extreme temperatures in use, information on temperature differences and resultant failure is valuable to designers and engineers.

Benefits of the windshield research are expected to be made available to civilians early next year by the Wright Air Development center.

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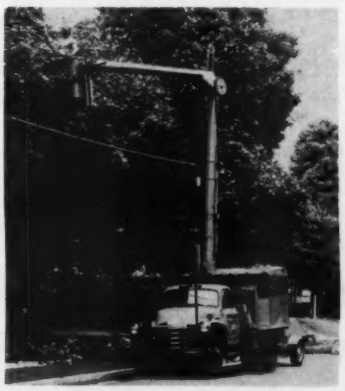

Directory is Issued To Aid New Engineers

Engineers' Job Directory, a new annual publication, has just been published by Decision, Inc., of Cincinnati. Oliver P. Bardes, president and publisher, announced this directory is designed to help many of the nation's outstanding companies put their "story" before graduating engineers.

This guide is the first directory of its type directed specifically for young engineers. EJD, the director's abbreviated name, helps the engineer research the better job market. The 129 participating companies include such "blue chips" as: Alcoa, American Steel & Wire Div., Babcock & Wilcox Co., Continental Can, Goodyear Tire & Rubber Co., IBM, Minneapolis-Honeywell Regulator Co., National Cash Register Co., Pittsburgh Plate Glass Co., RCA, cooperated in presenting key facts in capsule form, giving precise information about their company, industry, year founded, products, number of employees and whom to contact. This enables the engineer to coordinate and match his interests and capabilities with the company in getting the right job with the right firm.

EJD also includes a unique index section. Companies indicate the types of engineers they want, for example, chemical, electrical, mechanical, etc. The index also lists the plant, sales, and research laboratory locations by cities and states. Another section lists the companies interested in undergraduates for summer jobs. This enables these engineers to gain invaluable experience with these companies.

Engineers' Job Directory is being distributed to over 140 accredited engineering colleges and universities. Many favorable replies have already been received from placement directors indicating the value of EJD to placement offices. EJD is also being sent to many technical and engineering societies. Because the initial reaction has been favorable, circulation will be expanded next year.

Decision, Inc., is a pioneer in bringing industry and graduates closer together in the fields of business-education and personnel procurement.

Copies may be obtained for $2.25 from Decision, Inc., 105 E. Fourth St., Cincinnati 2, Ohio.

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